

INTEGRAL VALIDATION OF MINOR ACTINIDE NUCLEAR DATA BY USING SAMPLES IRRADIATED

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Japan Atomic Energy Research Institute (JAERI) has been developing technologies for partitioning and transmutation of long-lived nuclides in high-level radioactive waste. In the dedicated transmutation systems, reliable nuclear data of minor actinide (MA) are indispensable to obtain a reliable design of a transmutation system. Present status of MA nuclear data is not so satisfactory. To obtain reliable nuclear data of MA, significant efforts are needed not only for differential measurement of MA but also for the validation of reliability of existing data by using integral measurements. As such an effort, radiochemically analyzed data of the actinide samples irradiated at the Dounreay Prototype Fast Reactor (PFR) were used in this study. The samples were actinide oxides of 21 different isotopes from thorium to curium. In the present work, the burnup calculations were performed and the calculated results were compared with the experimental data to validate the reliability of neutron cross section data of MA in an evaluated nuclear data file JENDL-3.3, ENDF/B-VI, and JEFF-3.0.

The ORIGEN code was used for the calculational analysis of the irradiated samples. The 6 groups neutron spectra and the flux values, which were reported in the ORNL document, were used for the sample burnup calculations. For the cross sections of the samples, revised JAERI Fast Reactor Group Constant Sets (JFS-3) based on JENDL-3.3, ENDF/B-VI, and JEFF-3.0 were utilized. These 73-group libraries were then collapsed to a 6-group library corresponding to the 6-group described above. The one-group cross sections were calculated for the each PFR run using this 6-group library with the 6-group flux spectra for each reactor run.

The systematic validation of actinide cross section was given by the burnup calculation of actinide samples irradiated at PFR. Chemically analyzed data of actinide samples irradiated 492 days at PFR provides a variable database for integral evaluation of MA cross sections. We hope our data will be used widely to improve the reliability of MA cross sections.